NAVAL POSTGRADUATE SCHOOL
Monterey, California

EC 3550   MIDTERM EXAM I   4/98 Prof. Powers

- This exam is open book and notes.

- There is a 50 minute time limit.

- There are three problems; each is equally weighted.

- Partial credit will be given; be sure to do some work on each problem.

- Be *sure* to include units in your answers.

- Please circle or underline your answers.

- Do *NOT* do any work on this sheet.

• Show *ALL* work.

1	
2	
3	
Total	

Name: _____

1. An optical fiber loses 10% of its optical power after propagation through 1200 meters of a fiber. If the input power is 900 μW, at what distance will the power in the fiber have fallen to 270 μW?

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2. We want to design a Raman amplifier to amplify a weak optical signal by 20 dB. The signal is at a wavelength of 850 nm. The fiber amplifier is 1.1 kilometer long, has a mode-field diameter of 8 μm, and optical losses of 3.5 dB/km.

   (a) What should the wavelength of the pump beam be?
   (b) What should the power level of the pump beam be?

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3. Consider a 62.5/125 graded-index, multimode fiber with a core index of 1.460, a fractional index-of-refraction difference of 1.5%, and an index profile parameter, g, of 1.9. It is to be used with a source with a wavelength of 850 nm and a $\Delta\lambda$ of 10 nm.

   (a) Calculate the data rate-distance product for this link.
   (b) Find the maximum bit rate that can be supported by this link for a distance of 5 km.